



FEMA

January 2003

NOAA GOES-8 Satellite
May 3, 1999
Severe thunderstorms
generated killer tornadoes
in a swath from Chickasha
to Oklahoma City.

CREDIT: NOAA

★ Oklahoma City
★ Chickasha

Safe Rooms Save Lives

State of Oklahoma Safe Room Initiative

“We consider our homeowners our greatest asset.
If the home gets knocked down by a tornado,
at least the homeowners are still alive.”

— Susan Newland, Director of Altus, Oklahoma, Habitat for Humanity

Case Studies
STATE OF OKLAHOMA



Safe Room Initiative

On May 3, 1999, more than 70 tornadoes tore through Kansas and Oklahoma in the worst tornado outbreak in a generation.

As a result of these tornadoes, in Oklahoma alone over 44 persons died and almost 800 were injured. How could Oklahomans feel safe in future tornadoes? To help answer this question, the State of Oklahoma launched an initiative to promote and support the construction of storm shelters in homes. These shelters, built to FEMA guidelines, are called “safe rooms.” The initiative was the first large-scale effort to build thousands of safe rooms through a rebate program, and its success is a direct result of the involvement and strong support of the Governor of Oklahoma and the participation of partners in industry, business, government, and the private sector. Thousands of safe rooms were built and, although funding for the rebate program has ended, the initiative continues to result in the construction of safe rooms throughout the state.



Case Studies

STATE OF OKLAHOMA

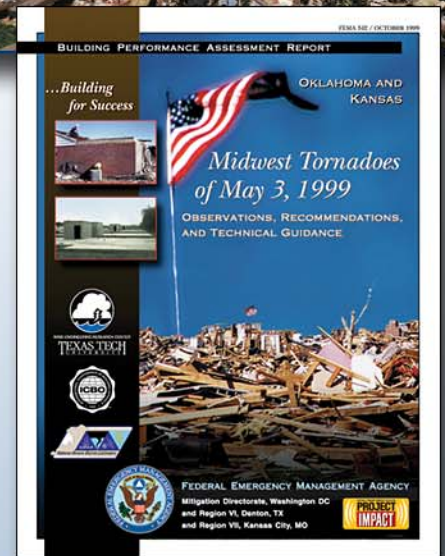


Safe Room Initiative

Approximately 90 percent of the buildings damaged by the May 3 tornadoes were single-family dwellings.



The damage to residential buildings ranged from light damage: broken windows and minor roof damage; to moderate damage: partial loss of roofs and walls; to severe damage: separation of buildings from their foundations, and total roof loss; to almost complete destruction with only small interior rooms surviving. In response to the tornado disaster, the Federal Emergency Management Agency (FEMA) deployed a Building Performance Assessment Team (BPAT) to observe and document damage. The BPAT concluded that the best means of reducing loss of life and minimizing personal injury during any tornadic event is to take refuge in rooms specifically designed to resist tornadic forces: safe rooms.



Although improved construction may reduce damage to buildings and provide for safer buildings, a safe room is the best means of providing homeowners near-absolute protection.

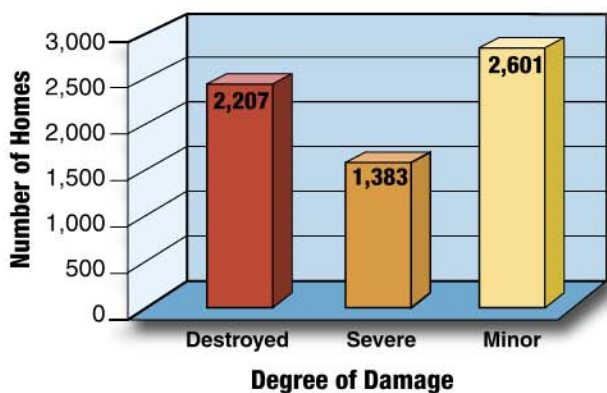
Case Studies



Making Tornado Alley a Safer Place To Live

Although the May 1999 tornadoes were devastating, violent tornadoes are nothing new to Oklahoma. The state is considered part of “Tornado Alley” and has historically been subject to destructive and deadly tornadoes and high winds. Oklahoma was the first state to promote a statewide residential safe room initiative to help build safer communities.

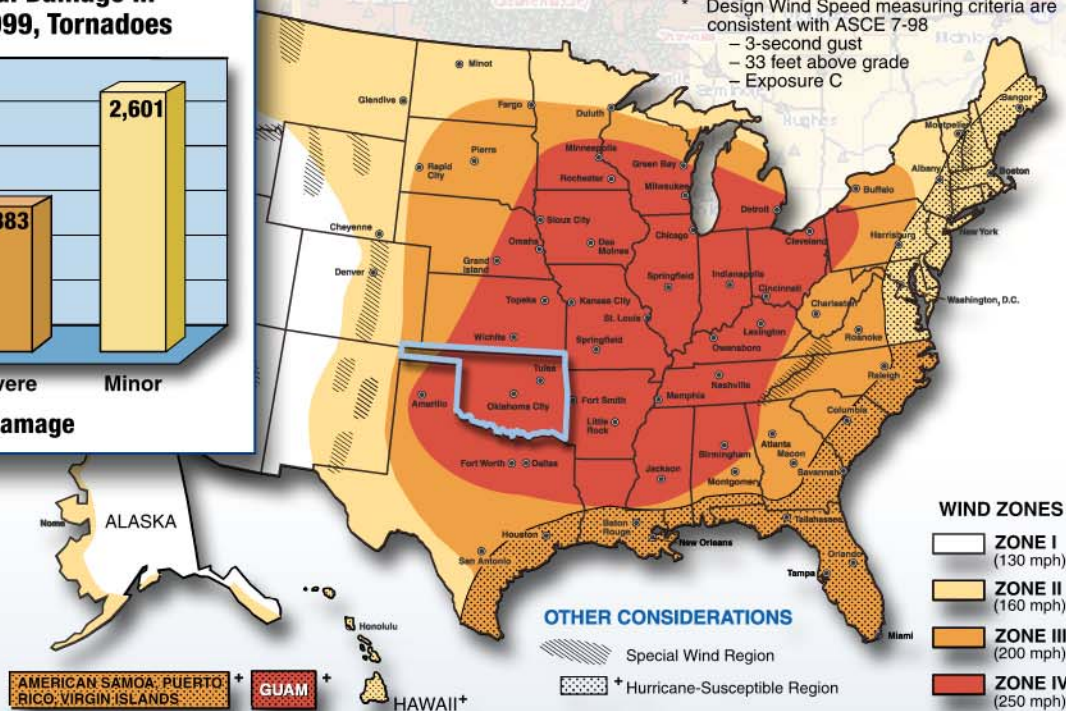
Single-Family Residential Damage in Oklahoma from May 3, 1999, Tornadoes



SOURCE: AMERICAN RED CROSS

Wind Zones in the United States*

* Design Wind Speed measuring criteria are consistent with ASCE 7-98
 - 3-second gust
 - 33 feet above grade
 - Exposure C



With over 6,000 single-family homes damaged, the number of inquiries to the safe room initiative was expected to be in the thousands. The State of Oklahoma created a safe room task force that developed a program to promote safe rooms in the state. The task force defined three basic objectives to help ensure a successful program.

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1

Public Education

Make the public aware of the safe room concept.

2

Financial Assistance

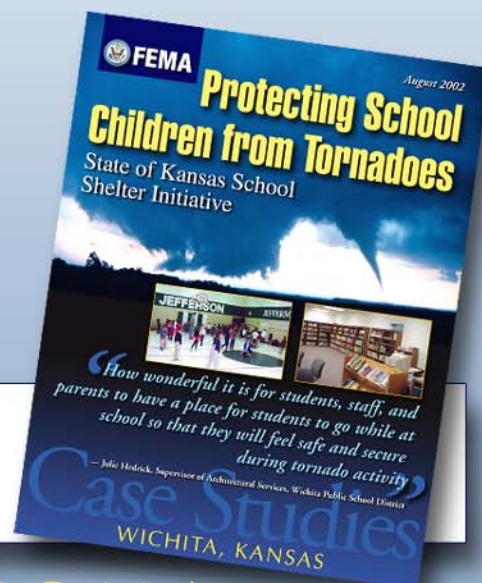
Provide financial incentives.

3

Quality Control

Ensure that safe rooms are properly constructed and installed.

After this same tornado outbreak, the State of Kansas initiated an aggressive shelter program to protect its school children from tornadoes. More information can be found at www.fema.gov/mit/saferoom/casestudies.shtm.





Safe Room Initiative

Public Education

An extensive public education campaign was launched by FEMA's Office of Public Affairs and supported by the State of Oklahoma. The campaign included a wide range of outreach projects, including:

- Public Service Announcements (PSAs): radio, television, and print
- Speaker's Bureau
- Resource and Educational Materials



The Safe Room Message Goes on the Road

In the first 6 weeks following the May 3 tornadoes, a little over 1,000 people requested information about safe rooms and how to reduce property losses. To make sure Oklahomans could see first-hand how their families and properties could be better protected, a mitigation tour called the *Safe Room Traveling Road Show* was created to provide this information where people worked, lived, and shopped. Teams of FEMA mitigation advisors fanned out across the state in vans to show people how to build disaster-resistant residential structures, with an emphasis on safe rooms. Each two-person team conducted workshops, distributed publications, and answered general construction questions. Four thousand people were reached in a 1-week period from June 13-19, 1999.

Mitigation Tour Sites



Site Visited

The mitigation tour teams were equipped with eye-catching display boards and tabletop models that illustrated safe room concepts and construction methods.





Financial Assistance

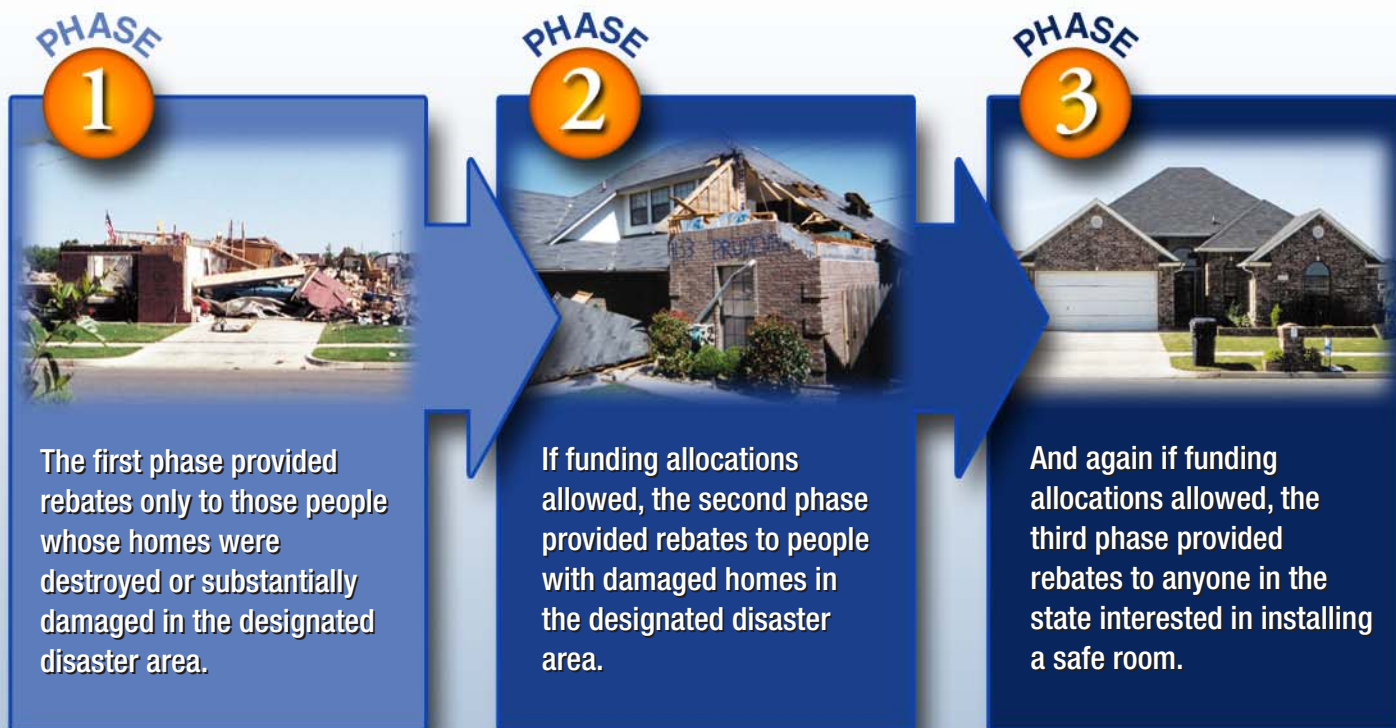
Safe Room Rebate Program

With the goal of saving lives in future tornadoes and severe storms, Federal and state agencies developed a first-in-the-Nation safe room rebate program, “Oklahomans Can Survive,” to help Oklahomans cover the cost of constructing safe rooms.

The program offered a \$2,000 rebate for installing a safe room. The state provided rebates to local jurisdictions on a worst-first basis from \$12 million dollars in Hazard Mitigation Grant Program (HMGP) funds. The funds were made available by FEMA for projects to reduce loss of lives and property from future severe storms. To be eligible for the rebate, the construction of a safe room above or below ground had to meet FEMA guidelines and state, county, and city standards.

To handle the large number of interested homeowners, a 1-800 number was established for rebate requests. The state maintained this line and referred all requests to local jurisdictions. Because the HMGP funds were limited, a three-phase process based on a worst-first criterion was established to ensure that those who experienced the worst damage were given priority.

Worst-First Basis Rebate Award Process



Case Studies

STATE OF OKLAHOMA



Financial Assistance

The Safe Room Rebate Process



Packet Contents:

1. Frequently Asked Questions
2. FEMA 320, *Taking Shelter From the Storm*
3. *National Performance Criteria for Tornado Shelters*
4. Letter of Eligibility
5. Safe Room Validation Form
6. Suggestions for Building Tornado Shelters



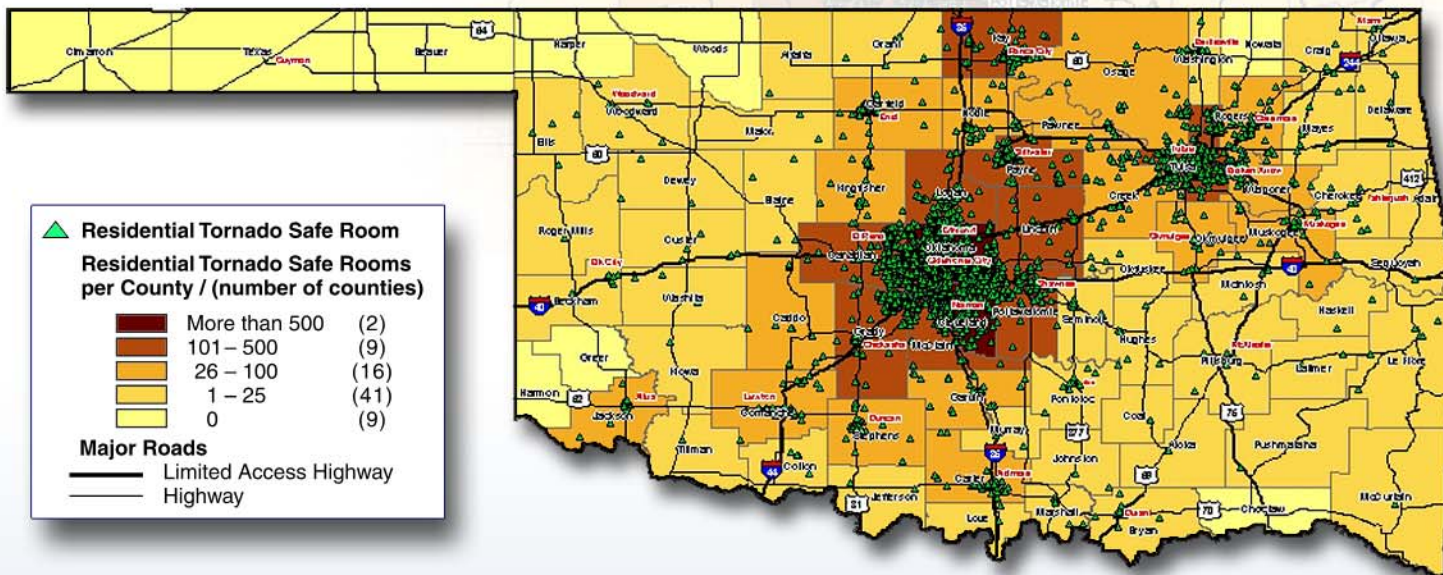


Financial Assistance

A Safe Room Mitigation Success

The safe room rebate program resulted in the construction of 6,016 shelters throughout the State of Oklahoma. As a result, thousands of Oklahoma residents who were previously at risk from tornadoes and high winds now have ready access to places of safety designed to provide protection from the most severe wind hazards.

Locations of the 6,016 Residential Tornado Safe Rooms Funded by FEMA Following May 1999 Tornado Outbreak



Geographic Information Systems (GIS)

GIS can be a valuable risk assessment and risk communication tool by enabling users to:

- Educate the public about the community's hazards and demonstrate effective loss reduction strategies.
- Prepare for response and recovery efforts by giving emergency managers complex information about infrastructure, potential damage, shelters, and casualties in a format they can quickly grasp.
- Demonstrate the benefits of past mitigation activities and the potential of proposed initiatives. GIS can communicate the effectiveness of building relocations, building code changes, altered land use practices, and evacuation and sheltering plans, for example.

Case Studies



Financial Assistance

Additional safe room financial assistance was provided by the U.S. Small Business Administration (SBA), the Department of Housing and Urban Development (HUD), and Fannie Mae.

SBA Disaster Loans

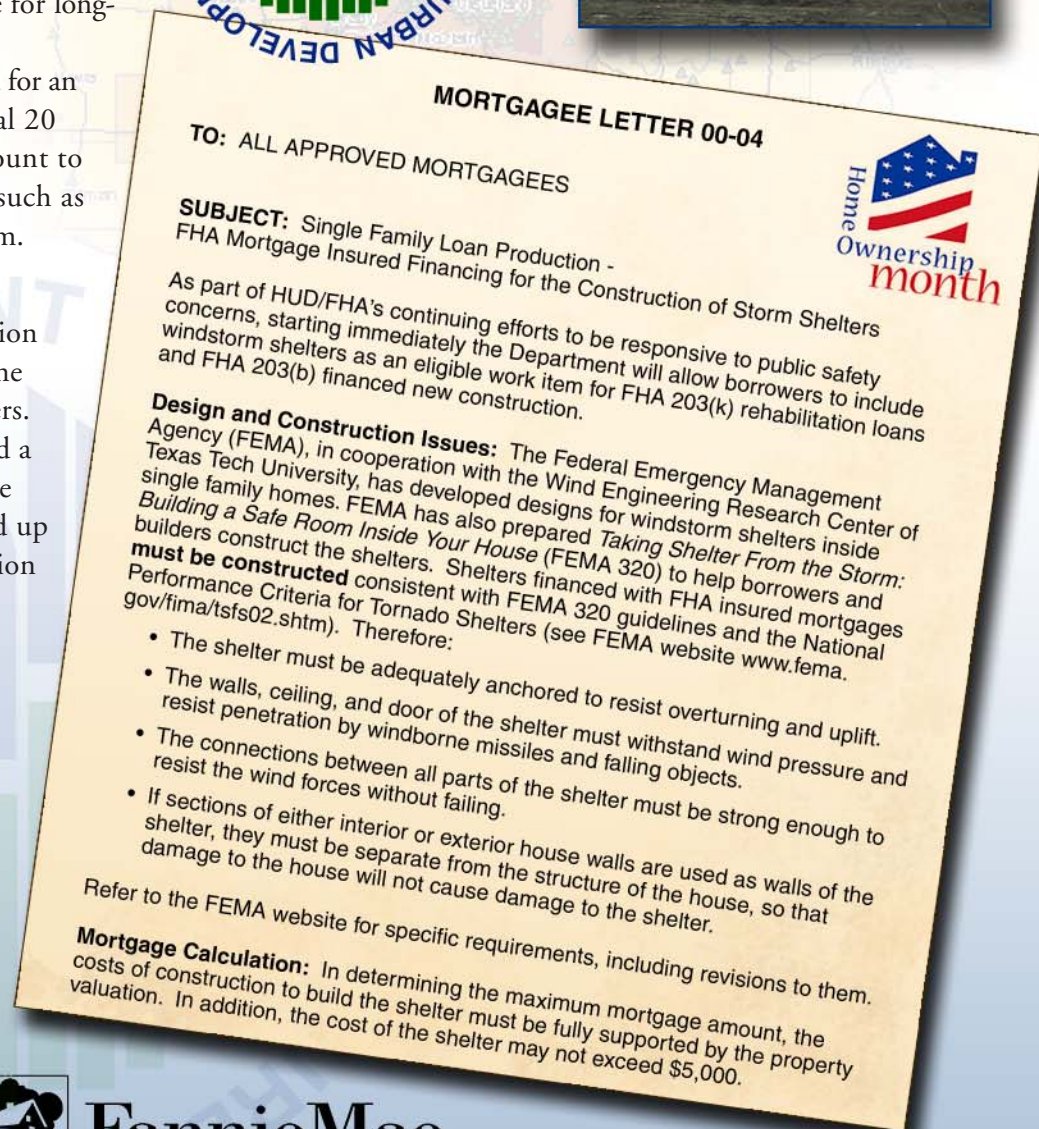
Low-interest loans from the SBA are the primary form of Federal assistance for long-term recovery for homeowners and businesses. Those who are approved for an SBA loan can borrow an additional 20 percent of the approved loan amount to cover any extra mitigation costs, such as the cost of constructing a safe room.

HUD-Insured Loans

The Federal Housing Administration (FHA), part of HUD, insures home mortgages for qualified homebuyers. For homebuyers who wish to build a safe room, the maximum allowable mortgage amount can be increased up to \$5,000 for safe room construction (Mortgagee Letter 00-04). Homebuyers pay for the insurance and fees, so no taxpayer dollars are used to secure the mortgages.

Fannie Mae Unsecured Loans

Fannie Mae offered unsecured financing for residential safe room construction or installation. The unsecured loan amounts ranged from \$1,000 to \$20,000. There were no minimum or maximum income requirements, rates were fixed for the life of the loan, and a borrower had up to 120 months to repay the loan.



FannieMae®



Quality Control

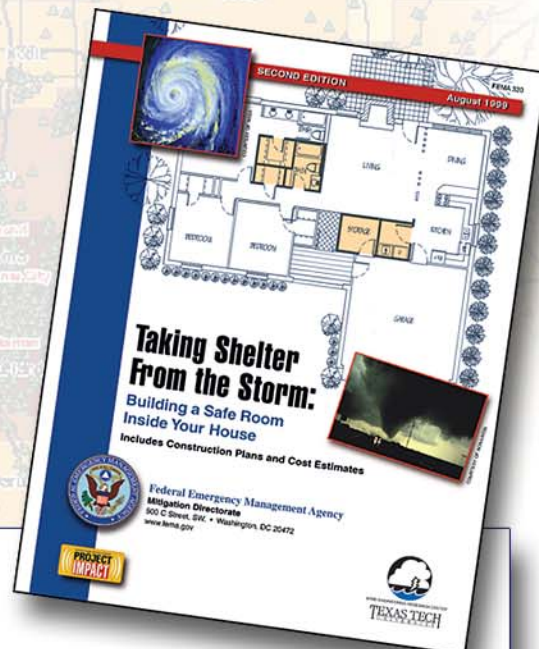
To ensure that safe rooms were constructed and installed to resist appropriate wind and debris impact forces, technical support and information had to be provided to the public and to builders and contractors who would be designing and constructing the safe rooms.

To meet this need, FEMA and the State of Oklahoma required that safe room and shelter performance standards be met, retained a technical representative, and conducted technical seminars.

Safe Room and Shelter Performance Standards

To ensure proper safe room construction, minimum performance criteria were designated for the safe room and shelter industry to meet. To qualify for the rebate program, the safe room or shelter construction had to be built according to:

- the design plans depicted in FEMA publication 320, *Taking Shelter From the Storm*, or
- other FEMA-defined performance criteria.



FEMA 320

In August 1999, FEMA published the second edition of *Taking Shelter From the Storm: Building a Safe Room Inside Your House* (FEMA 320) to provide technical guidance to homeowners interested in building a safe room for protection from high winds. FEMA 320 contains tornado and wind hazard maps, a homeowner risk assessment worksheet, construction drawings for several types of residential safe rooms, and other information that will help a homeowner assess the risk in a given area, determine the need for a safe room, and choose a safe room design. The construction drawings provide all of the information that a contractor needs to build a safe room, including connection details, specifications, and material lists for concrete, concrete masonry unit, wood-frame, and insulating concrete form designs.



An example of an aboveground safe room designed to be used as a closet.



Quality Control

Technical Safe Room Representative

An engineer was retained during the safe room initiative to assist the state in providing technical support. The engineer worked closely with FEMA and Texas Tech University's Wind Science and Engineering Department to address technical concerns. The engineer's key responsibilities included:

- meeting with safe room contractors to answer questions and help contractors meet FEMA safe room and shelter guidelines
- making presentations concerning FEMA safe room and shelter guidelines at industry trade shows and conferences
- educating the general public about choosing a safe room construction contractor and helping homeowners with complaints against contractor performance

“Having technical experts available as a state resource to address construction standards and technical issues was imperative to promote quality shelter construction, as well as provide specific information to the public to ensure that customers were getting a properly made product.”

— Fred Liebe, Deputy Director, Oklahoma Department of Civil Emergency Management

Ensuring Customer Satisfaction

Customer complaints are not uncommon on small construction projects. To ensure that homeowners were satisfied with the quality of the work performed under the safe room initiative, FEMA and the State of Oklahoma established a process by which complaints could be resolved. If a homeowner was not satisfied with a contractor's or vendor's work, the homeowner could discuss the complaint with the state's safe room technical representative. The technical representative would arrange for local and or state officials to inspect the shelter and verify the complaint. If the complaint was valid, the technical representative would contact the contractor or vendor on behalf of the homeowner and explain the steps that needed to be taken to ensure that the shelter would meet FEMA requirements. In most circumstances, problems were corrected by the contractor or vendor. If the problem remained unresolved, the technical representative referred the homeowner to the following organizations:

- Oklahoma Attorney General's Consumer Protection Division
- Better Business Bureau
- Local Chamber of Commerce



Safe Room Initiative

Quality Control

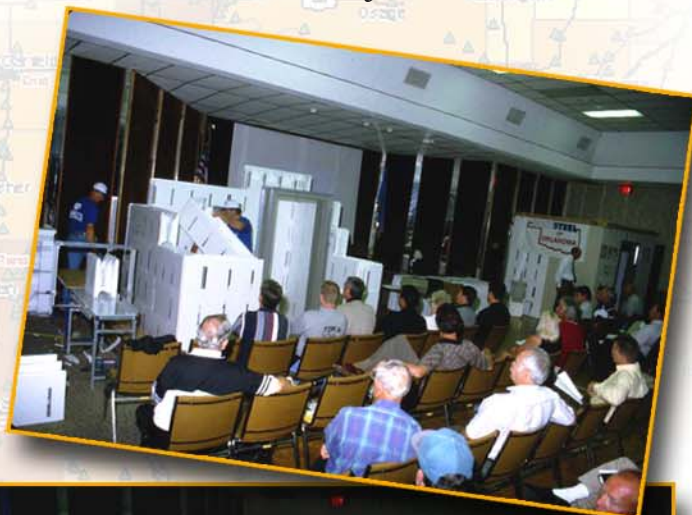
Government and Industry Work Together To Promote Safe Rooms

Technical Seminars

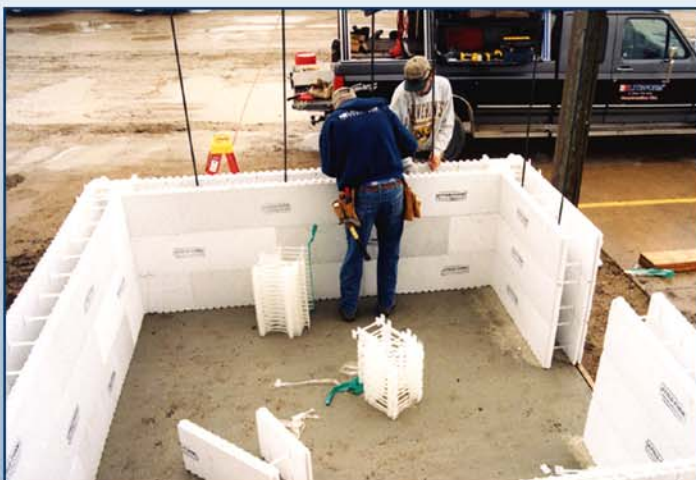
Public-private partnerships were established to address non-conventional construction methods for safe room construction. FEMA and the construction industry were instrumental in providing technical information to the public, builders, and contractors concerning the correct and most efficient safe room construction methods. Seminars included discussions of the FEMA safe room criteria and full-scale demonstrations of various construction methods.

Technical Seminar Participants

- Oklahoma Department of Civil Emergency Management
- FEMA
- Oklahoma Ready Mixed Concrete Association (ORMCA)
- Polysteel of Oklahoma
- Portland Cement Association (PCA)
- Insulated Concrete Forms Association (ICFA)
- Heartland Homebuilders
- Engineered Wood Association (APA)



Construction industry conducts seminars and workshops.



American Polysteel and Lite-Form International developed safe room kits that include everything a homebuilder needs to build a safe room, including the walls, roof, and door.

Case Studies



Safe Room Initiatives Continue

Lawton, Oklahoma

The State of Oklahoma continues to support the safe room initiative. In the fall of 2001, Lawton, Oklahoma, received \$75,000 in Predisaster Mitigation funds to start a local safe room rebate program. Under the program, modeled after the state's safe room rebate program, homeowners are eligible for a \$1,500 rebate to offset safe room construction costs of \$2,000 or more. Rebates are issued on a first-come, first-served basis until funds are depleted. All safe rooms, including aboveground, belowground, and retrofits, must comply with the guidelines of FEMA 320, *Taking Shelter From the Storm*, or other FEMA-defined criteria. If the shelter is constructed according to the pre-engineered designs in FEMA 320, no Professional Architect's or Engineer's seal is required. All other shelter designs or alterations to the FEMA pre-engineered designs will require a Professional Architect's or Engineer's seal.

The City of Lawton established special permitting requirements and procedures for constructing safe rooms to ensure proper construction and installation. To maintain a record of safe room construction and installation, the city requires a separate building permit for the safe room. The safe room building permit is issued concurrently with the main structure building permit. Also, a separate Certificate of Occupancy must be obtained for the safe room to ensure that it meets FEMA guidelines and the city's building codes. For the retrofit of an existing structure, a pre-permit inspection by the City of Lawton code officials is required before a building permit can be issued. The purpose of the inspection is to ensure that the proposed safe room complies with FEMA guidelines and the city's building codes.



According to Ed Oswald, owner of Oswald Real Estate, Logan County, Oklahoma, homebuyers are definitely interested in homes containing safe rooms. They give the homeowner an added sense of safety and security during severe weather.

“Safe rooms are a great selling point in any home.”

— Ed Oswald, Owner of Oswald Real Estate



Oswald Real Estate Listing:

Beautiful brick home 2,151 sq. ft., built 1999

3 bed, 2 bath, living room w/fireplace, dining room, breakfast area
Kitchen has custom-made oak cabinets
Utility room w/custom-made oak cabinets and storage shelves

Master bedroom has safe room and Jacuzzi

Attached 2-car garage; outbuilding – 1 barn w/shop, corral





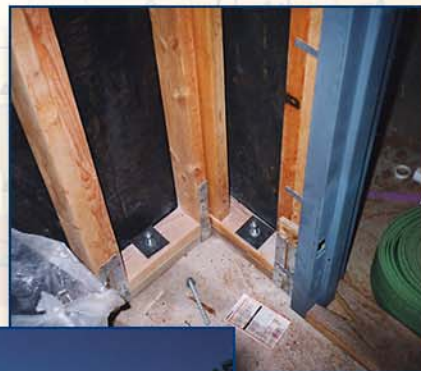
Safe Room Initiative

Safe Room Communities

Legacy Park

Even before the May 1999 tornadoes, an effort was being made to promote safe rooms in the Tulsa area. Bill Rhees of BMI Construction, then the president of the Tulsa Home Builders Association, and Wayne Farabaugh of Perfection Homes constructed aboveground safe rooms in their showcase homes as part of the 1999 Parade of Homes, which was held only 1 month after the May tornado disaster. Of course, the homes with the safe rooms received overwhelming attention.

In late 1999, as a result of the public interest, BMI Construction formed a team of 10 builders—Federation Builders, LLC—and worked with developer Lindsay Perkins to construct Legacy Park in Tulsa, Oklahoma, the first subdivision in the country in which every home was equipped with a safe room. Legacy Park opened in 2000. Further evidence of increased public interest in residential safe rooms could be seen in the 2000 Parade of Homes, which featured 10 homes with safe rooms and demonstrations of wind resistance strengthening techniques for the home.



Base plate of safe room wall during construction. Note metal straps, floor anchor bolts, and oversized washers.



The Village at Central Park

Tulsa's newest downtown community, the Village at Central Park, features classic architecture, urban views, stylish interiors, and safe rooms! The developers of this community follow a "New Urbanism" philosophy that promotes connecting the community to civic ideals and public responsibility. One key responsibility is public safety. The Village at Central Park is promoting public safety by providing safe rooms as a standard feature with all townhomes.



Safe room during construction. The walls consist of two layers of 3/4-inch plywood with 14-gauge steel sheathing.

Door of finished safe room. A six-point connection to the door frame is provided by three hinges and three deadbolts.

“Almost every home we have built since the disaster has had a safe room in it.”

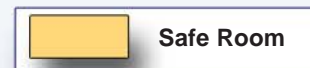
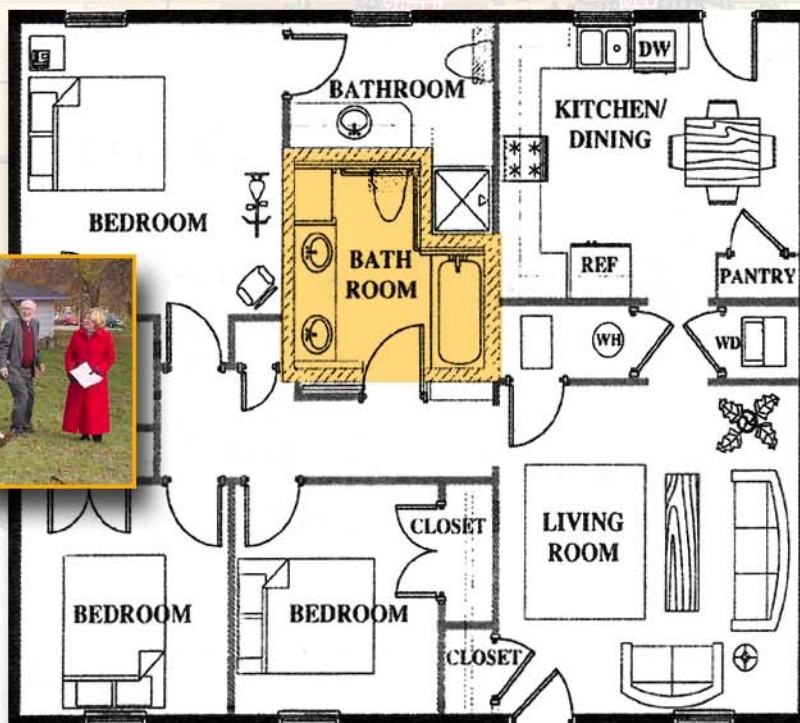
— Bill Rhees, BMI Construction



Safe Rooms for Everyone

Neighbor for Neighbor – Millennium House

On November 15, 2002, a groundbreaking ceremony was held to begin the construction of the Millennium House, a project of Neighbor for Neighbor, a nonprofit, privately funded agency that serves the disadvantaged. The Millennium House will serve as a model home for low- to moderate- income families in North Tulsa, Oklahoma. The house plans call for a handicapped-accessible, single-story unit of roughly 1,200 square feet. The main bathroom doubles as a safe room, using a unique sliding steel door whose design was reviewed by Texas Tech's Wind Science and Engineering Research Department.



Millennium House Sponsors and Partners:

- Neighbor for Neighbor
- American Institute of Architects of Eastern Oklahoma
- American Lung Association
- City of Tulsa
- Manhattan Construction Company
- Citizen Corps
- Tulsa Foundation for Architecture
- Tulsa Partners



The **Community Action Project (CAP)** of Tulsa County helps individuals and families in economic need achieve self-sufficiency. CAP teamed with Tulsa's Predisaster Mitigation Program to provide safe rooms for low-income first-time home-buyers. With a grant of \$35,000 (awarded in August 2001) to install prefabricated aboveground safe rooms in qualified homes, CAP provided 10 families with safe rooms. The costs ranged from \$2,600 to \$4,900, depending on family size and construction constraints.

Habitat for Humanity

Habitat for Humanity is a nonprofit organization that uses volunteers and future homeowners to build decent, affordable housing. Each Habitat for Humanity affiliate composes a local policy that defines standard features of a home that are necessary for their geographic location. Habitat for Humanity of Altus, Oklahoma, defined a tornado safe room as a standard feature; therefore, every home they build will have a safe room.





In the News

Oklahoma Voters Approve Exemption of Safe Rooms from Property Tax

November 5, 2002 – Oklahoma voters overwhelmingly approved State Question 696, amending the Oklahoma Constitution to exempt small storm shelters from property tax. The vote was 583,648 to 306,593. The question, as approved, amends Section 6 of Article 10 to exempt up to 100 square feet of storm shelter (including safe rooms built within a home) from property tax if the shelter provides protection and safety from tornadoes and if it was installed on or after January 1, 2002. Transfer of real property with an exempt storm shelter would result in the shelter being subject to property tax.

The National Symposium on the Great Plains Tornado Outbreak

On April 30-May 3, 2000, the University of Oklahoma hosted the National Symposium on the Great Plains Tornado Outbreak of May 3, 1999. This event drew more than 400 professionals from around the world in the areas of meteorology, epidemiology, wind engineering, emergency management, construction science, and the social sciences. The symposium was preceded by a half-day safe room and tornado shelter exposition that was open to the public and attended by more than 1,000 people. Both events were completely free under the sponsorship of public and private agencies.

The symposium brought together a variety of disciplines to examine the response to a major tornado disaster from a holistic point of view with the goal of defining lessons learned and enhancing the response to future disasters. The Oklahoma shelter initiative and its successes were among the issues addressed.

The symposium concluded that the initiative was particularly successful in:

- educating the public about tornado risks and effective methods of protection
- demonstrating that safe rooms capable of providing near-absolute protection from tornadoes could be built with currently available construction methods and technology
- encouraging the formation of local, state, and national partnerships across disciplines and agencies to promote the safe room concept and ensure the quality of safe room construction

“Storm shelters save lives. Perhaps, more important, they offer peace of mind, knowing a safe place is available when severe weather threatens.”

— Ernst W. Kiesling, P.E., Ph.D., Director of Shelter Program,
Wind Engineering Research Program, Texas Tech University

Case Studies



Summary

The State of Oklahoma's safe room initiative was the first statewide safe room mitigation program in the Nation. Under the initiative, homeowners, government officials, private industry, research and academic institutions, and non-profit groups worked together to promote safe room construction and create safer communities for future generations. Their efforts have resulted in the construction of over 6,000 residential safe rooms, through the rebate program alone, throughout the State of Oklahoma. As a result, the next time severe weather threatens Oklahoma, thousands of families will have a place of refuge and added peace of mind.

The success of the safe room initiative can be attributed to the enthusiastic and creative approach of the involved organizations:

- Research and academic institutions provided technical guidance concerning safe room issues.
- Inventive and aggressive outreach programs introduced the safe room concept to homeowners.
- Public and private partnerships educated homeowners and the construction industry about how to ensure the quality of the safe room construction and installation.
- State and Federal partnerships provided financial incentives to help homeowners construct safe rooms.
- Proactive non-profit organizations recognized the risk and adopted safe room philosophies in their programs to help provide safe rooms for families in need.
- Builders, developers, and realtors reassessed the home market and developed safe room communities.



Additional information about safe rooms can be found on the FEMA website, at www.fema.gov/mit/saferoom, and on the website of the National Storm Shelter Association, at www.nssa.cc.